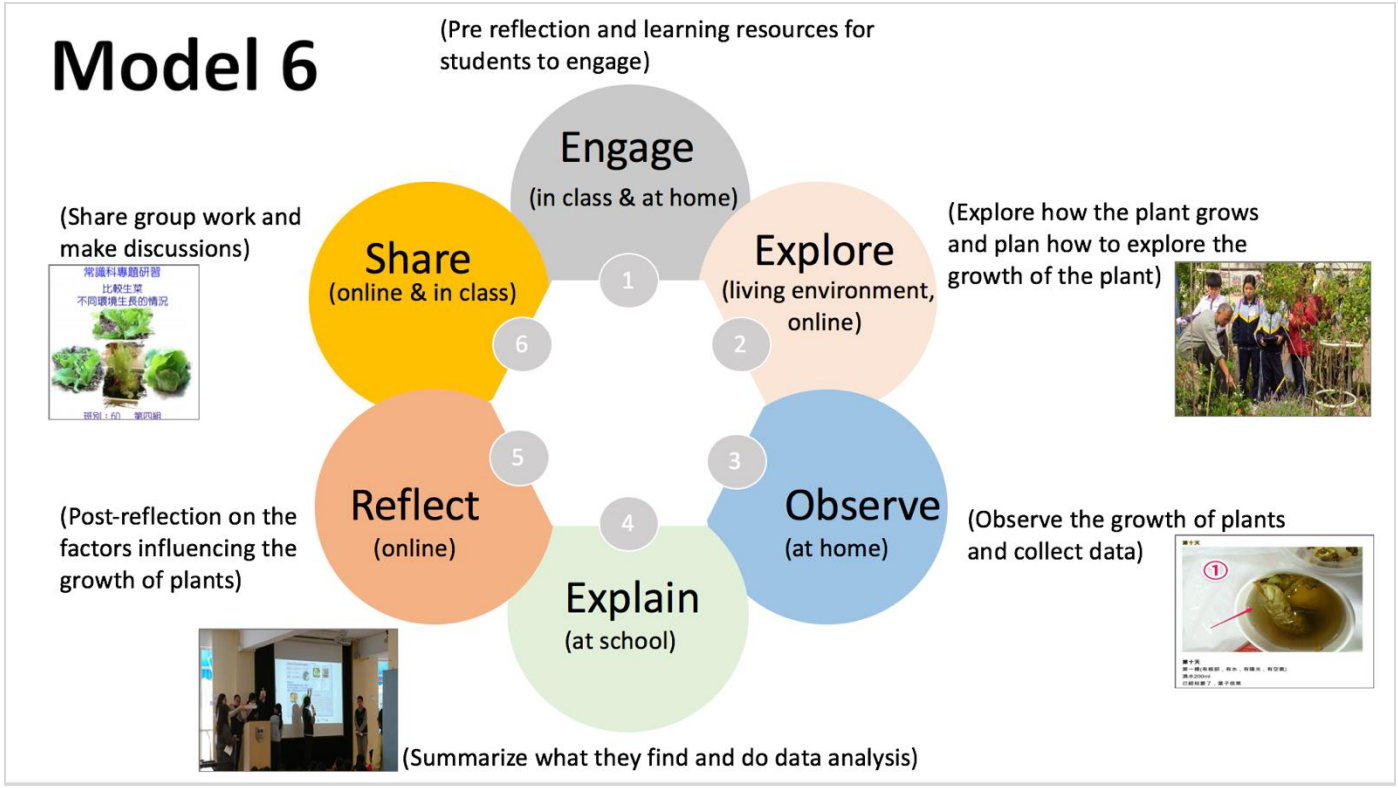
Teaching Plan: Model 6



年級：六年級本地班　　課題：植物的適應力　　單元: 適者生存

課冊：6B 冊第五課　　負責教師：

已有知識：
1. 學生能指出生物與非生物的分別。
2. 學生能指出簡單的動物及植物名稱。
3. 學生能指出植物的各部分。
4. 學生能指出令植物生長的重要因素:水分, 陽光, 空氣。
5. 學生能操作 Google Classroom，及簡單應用軟件(Skitch, Evernote, SimpleMind ,AR)。

學習目標：
1. 說明不同環境對植物生長的影響。
2. 分析植物的根、莖和葉等功能。
3. 探究植物的根、莖和葉的特徵與環境的關係。
4. 欣賞植物適應環境的能力。

(批註： 最好從知識，技能和態度來描述學習目標)

Level:	**Subject:**	**Prior Knowledge:**	
Primary 6	Science	1. 學生能指出生物與非生物的分別。 2. 學生能指出簡單的動物及植物名稱。 3. 學生能指出植物的各部分。 4. 學生能指出令植物生長的重要因素:水分, 陽光, 空氣。 5. 學生能操作 Google Classroom，及簡單應用軟件(Skitch, Evernote, SimpleMind , AR)。	
Unit: 單元	**Theme:** 課題	**Lesson Duration:**	**Settings**
適者生存	6B 冊第五課:植物的適應力		Home, class, markets, living environment…
Objectives:	**Knowledge**	**Skills**	**Attitudes/values:**
	Recognize the ability of plants to adapt to their learning environments	(21st century skills: problem-solving, self-directed learning)	Appreciate the plants' adaptability to their living environments, and curiosity

TPACK		
Knowledge	Pedagogy	Technology
• 說明不同環境對植物生長的影響。 • 分析植物的根、莖和葉等功能。 • 探究植物的根、莖和葉的特徵與環境的關係	STEM pedagogical model using inquiry-based learning approach (“productive failure” instructional design) STEM • Science: 根、莖和葉等特征、功能及與環境的關係 • Technology: Google Classroom, Skitch, Evernote, SimpleMind, AR • Engineering: Ask each students to prepare/make two containers for each 根 to grow (different living environments may influence the growth of the 根、莖和葉) • Mathematics: Ask the students to measure the growth of the 莖和葉 in the two different living environments (assume the 根 are the same sizes) • + English language: is used to explain the inquiry process and findings	• Google Classroom: Social network platform where for students: (1) they could work in groups; (2) they could post their resources/comments/greetings/coordination messages there; for teachers: (1) they could post lesson objectives; (2) resources; (3) requirements, etc. to share with the class • Skitch: for annotating pictures collected • Evernote: for writing reflective journals (video, audio and text) • SimpleMind: for KWL • AR: for explaining the inquiry process and presenting the findings • Camera/recording functions: for taking pictures, doing recordings (during observation) • Rulers: (any digital tools?) for measuring the length of the 莖和葉 in daily.

Pedagogical design

探究“植物的適應力”

Group work	What they need to do	
3-4 in one group	In groups (discussion) Choose one or two groups in the class, ask them to record their face-to-face discussions for tracking their learning progress; as for online discussions, ask them to conduct it on GoogleClass so that we can document their discussions.	Individually
	● What are the factors in the environment that may influence the growth of the plant? ● What plants they want to study (one or two kinds at most) ● What factors may influence the growth of the plants (each group member finds out one factor, e.g., sunlight, or water, or soil…, but focuses only on one factor as the independent variable, and the growth of the plant as the dependent variable; by doing so, they can reach conclusions ● Each group focuses on at most 2 factors that can influence the growth of the plant (e.g., light, water…)	● Each group member is asked to raise two identical plants: with different environments, e.g., if the student chooses the sunlight as the main factor influencing the growth of the plant, then he/she can prepare two plants with the same container, same height/size plant, same soil/water…, but put one on stronger sunlight, one without much light. Then see the differences of the growth after a period of time ● Use the mobile device to capture the environments, the growth of the plant daily; ● Use rules to measure its height each day…

Activities (As)	lessons	Description	Knowledge	Skills	Technology
A 1 Generation (Engage) (in class and or at home)	e.g., 1 lesson	**Engage:** Pre-reflection: Q1: what do you know about the factors in the environment that may influence the growth of the plant? Draw a concept map to show what you know about it. Q2: What do you want to know about			1. GoogleClassroom: The teacher can upload relevant resources, lesson objectives/requirements etc. to the platform; students can share their

		the factors in the environment that may influence the growth of the plant? **Provide learning resources** for students (e.g. online resources? Or ask the students to observe the living things around them, then raise questions to explore: e.g., ● Can light influence the growth of the plant? ● Can water (more or less) influence the growth of the plant? ● Can container (透氣性) influence the growth of the plant? (要用量器記錄放水的量)? ● … **Generation:** Raise their inquiry questions: What are their hypotheses?			views and pictures and make comments; 2. Evernote: pre-reflection (you can either ask the students to do the reflection using paper and pen, or ask them to make recordings/video of their reflections or write their reflections and upload them to Evernote. 3. SimpleMind: As for the concept map, they can draw it using SimpleMind and upload it to Evernote. 4. Camera: they can take pictures of the living things and environment around them related to the topic. 5. Recording: for reflection 6. Video: they can also make video clips
A 2 Explore (living environment, online	e.g., 2 lessons in class, 10 days at	● Explore how the plant grows ● Plan how to explore the growth of the plant (what things they need to prepare?)			GoogleClassroom: Discuss with group members how to do the inquiry either face to face or on GoogleClassroom.

	home …				
A 3 Observe (at home)		Collect data: take photos, recordings (The teacher can prepare an observational table with key things to observe and key things to take record), and upload them to GoogleClassroom (in groups but other groups can see and give comments). Students also share other information about the growth of the plant on GoogleClassroom in the public area and comment on other's work.			1. GoogleClassroom: students can share artifacts on the platform if they want or make comments 2. Camera: Document the environment and the process of the plant growth 3. Recording: whatever they want to record. 4. Taking record of the plant's growth daily and upload them to GoogleClassroom 5. AR: Students can make a recording of the plant's different growth stages and make ARs
A 4 (Explain) (at school)		Summerize what they find, do data analysis (tables, graphs, pictures) Present results [see whether students can integrate the knowledge regarding science, technology, engineering (may not have), mathematics and language (use language to present) together].			Groups can prepare how to integrate and present the results, and make a short video
A 5 Reflect (online)		Reflect on the guided questions in Evernote, e.g., Q3: What have you			● Evernote ● SimpleMind

		learned about the factors in the environment that may influence the growth of the plant (you and your group members raised)?			
A 6 Share (online & in class)		The students upload their AR to Google Classroom in groups and share with other groups; they can comment on each group's work; they also share their work face-to-face in class for evaluation.			● GoogleClassroom ● AR

Other data: Pre-& -post knowledge test; survey of students' problem solving skills; survey of students' self-directed learning skills; teacher interviews and students' focus group interviews/discussions (about 2-3 groups of students)

課節	教學步驟／活動	教具	評估工具 （工作紙／課業）
1	**思維學習: 明白腦圖(mind-map)與概念圖(concept map)的分別。** 1. 學生前測(K-W-L approach): – What I already know (K) – What I want to know (W) – What I have learned (L) 2. 著學生完成工作紙內有關植物的導引問題: - What do you know about plants? Please list what you know first and try to draw a concept map. 請列舉你所知道的所有關於植物的知識，並用概念圖畫出來。 – What do you want to know about plants? 你還想學習哪些有關植物的知識？	- Simple Mind (App): KWL-Plants - 電子書學習內容:	- Simple Mind (App): KWL-Plants

課節	教學步驟／活動	教具	評估工具 （工作紙／課業）
2	**目標 1: 說明不同環境對植物生長的影響** 1. 此部分略教:展示不同環境中植物的相片(E-book) 學生討論環境對植物生長的影響 2. 總結同學的資料不同環境的植物大致如下: - 温帶草原：終年覆蓋着常綠的草本植物。草原上亦有樹木生長，但十分稀少，一般樹木的高度不超過 15 米。 - 熱帶雨林：是全球植物生長最茂盛的地方，當中可看到幾個植物的層次。最上層是較高大的喬木，中層是矮小的樹木，最底是蕨類、苔蘚等能適應陰暗環境的植物。另外，在樹幹上還可找到藤本植物和附生植物。 - 沙漠：由於沙漠沒有肥沃的土地，且水源極少，所以只有較少植物生長，如仙人掌、蘆薈等。 - 極地：由於生長環境惡劣，植物十分稀少，只能在山谷上找到為數不多的苔蘚、地衣及有花的草本植物。	「不同環境中的植物」相片簿 (教育出版社:Book 6.3 第二課)	
3	**目標 2: 分析植物的根、莖和葉等功能。** (A) 葉的探究: 葉的大不同 1. 著學生到校外搜集不同種類的已枯萎的葉，並將植物的外表拍下再帶回校。 2. 與同學分享及觀賞 3. 參考網頁，找出葉的功用及結構: http://taiwanplants.ndap.org.tw/leaf.htm - 認識葉的各部份 - 認識兩大類葉子: 單葉與複葉 - 認識單子葉植物與雙子葉植物，將搜集的葉分類。 - 從搜集得的葉以不同形狀分類，如卵形、橢圓形等。 4. 就今天所學及搜集的樹葉，寫一篇學習日誌。(Evernote, AR) 內容: (a) 分類活動時的照片 (b) 我在學葉的分類時有什麼新發現? (c) 我在學葉的結構時有什麼新發現? (d) 活動後的感想	參考網頁，找出植物各部分的功用及結構: http://taiwanplants.ndap.org.tw/leaf.htm - 學生搜集的樹葉 - 大壁報底紙供學生分類用	- 葉的大不同 - 搜集不同種類的已枯萎樹葉 - AR: videos and photos - Evernote: 學習日誌 (一) - 葉子分類圖(以大壁報底紙表達)

課節	教學步驟／活動	教具	評估工具 （工作紙／課業）
4	**目標 3: 探究植物的根、莖和葉的特徵與環境的關係。** 1. 老師略教根和莖的構造 - 根的功用，根的種類，根與人類生活 - 莖的功用，莖的種類，莖與人類生活 2. 到街市/超級市場找些莖/根類蔬菜(每類各一)，將植物的外表拍下，再回校與同學分享。 3. 就今天所學，寫一篇學習日誌。學習日誌內容: (a) 活動時的照片 (b) 以上蔬菜外型及結構有何特徵? (c) 我在學莖和根的分類時有什麼新發現? (d) 活動後的感想	- 參考網頁，找出根和莖的功用及結構: (1) http://taiwanplants.ndap.org.tw/root.htm (2) http://taiwanplants.ndap.org.tw/stalk.htm -	- Evernote: 學習日誌 (二) - AR: videos and photos
5	**目標 4: 分析不同環境因素對植物生長的影響。** 1. 老師帶領各組，思考有何因素可讓植物生長得良好。 例如: 陽光，水份，泥土養分等 2. 每組選定一種蔬菜去種植 (建議: 薯仔，綠豆，薑，蒜頭，蕃薯) 3. 先從不同途徑尋找自選蔬菜的各部分的圖片，以指出它牠們的結構 (Skitch) (例如: 薑是植物的根，學生要尋找薑的其他部份，如薑的花，種子，葉等) ** 老師引導各組定題作假設，如何令植物生長得更快更好? - 先作假設，再作實驗測試引證 - 整個過程均須作拍攝 AR (相片或影片)及作學習紀錄 (Evernote) - 可同時種植兩棵同類植物作測試比較 - 可做實驗測試兩棵植物在不同環境因素種植下，所含養份有何不同 (如: 用碘 IODINE 測試薯仔的澱粉含量)	- 植物的實物 - 網上資源	- Skitch app - Evernote: 學習日誌 (三) ** Evernote 學習日誌